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NOTE.

The distances of the moon have been corrected from the effects of refraction, parallax and the spheroidal figure of the earth. In calculating the refractions, allowances have been made for the state of the barometer and thermometer.—To deduce the longitude of the moon, use has been made of the longitudes of the stars lately determined by Maskelyne.

No. LIV.

Observations on the Comet of 1807—8. By William Dunbar.

Read November 18th, 1808.

THESE observations were made in latitude $31^{\circ} 27' 48''$ N. and $6^h 5' 50''$ nearly, west of Greenwich. The instrument principally used for taking distances was a circle of reflection by Troughton of London, graduated by the Vernier to ten seconds of a degree, and firmly supported upon a pedestal, adapted to every necessary movement; the observations were made with the most scrupulous care, and as the pedestal afforded every desirable facility, no observation was written down until it had been re-examined several times by the separation and re-union of the images. The clock was regulated to mean time.

This comet was first seen here about the 20th of September 1807, and Seth Pease Esq. Surveyor of the Mississippi Territory, began to make observations on it the 22d of the same month; and as I have the greatest reliance on the correctness of this gentleman (who is an excellent astronomer) I shall here give his observations which precede my own.

Observations by Seth Pease Esq.

| | h | ' | " | | ° | ' | " |
|---------------------------|---|----|----|----------------------------------|----|----|----|
| 1807. Sep. 22. Tuesday at | 7 | 12 | 16 | Comet northerly from Saturn | 7 | 21 | 15 |
| | 7 | 34 | 17 | ditto. below α Serpentis. | 24 | 16 | 30 |
| 23. | 7 | 20 | 00 | ditto. north of Saturn. | 7 | 46 | 7 |
| | 7 | 28 | 00 | ditto. below α Serpentis. | 22 | 41 | 15 |
| 24. | 7 | 2 | 00 | ditto. below α Serpentis. | 21 | 12 | 30 |
| | 7 | 13 | 00 | ditto. north of Mars. | 19 | 33 | 30 |
| 25. | 6 | 45 | 00 | ditto. below α Lyræ. | 69 | 50 | 25 |
| | 6 | 55 | 00 | ditto. north of Mars. | 20 | 25 | 15 |

This evening I observed an emersion of the 1st satellite of Jupiter, with a six feet Gregorian reflector, power 128, at $8^h 27' 58\frac{1}{2}''$ mean time; a fine observation; the sky was very serene: from the darting of the first ray from the satellite, it seemed a mere point of light for 15 seconds of time; perhaps with telescopes in general use the satellite might have remained invisible during those 15 seconds, which would affect the longitude resulting from the observation; from the above, the longitude deduced is $6^h 5' 55\frac{1}{2}''$ west of Greenwich.

The following are my own observations:—

1807, October 2d. The reflecting telescope, power 128, being directed to the comet, shewed the nucleus and coma with tolerable distinctness; the idea produced in the mind of the observer, was that of a round body in combustion, which had produced so much smoke as to obscure the nucleus; the smoke seemed to be emitted in every direction; but, as if it met on one side with a gentle current of air, the smoke seemed to be repelled and bent round the nucleus, escaping on the opposite side, in the direction of the tail. To the naked eye, the comet could not be seen earlier in the evening than a star of the second or third magnitude, although its disk was considerably larger; with the telescope, the nucleus did not seem to be much more than one third, certainly not one half of the planet Mars, which had been lately observed. The Coma seemed to be at least ten times the magnitude of the nucleus; an imperfect measure was taken of the tail, which was about $63'$ in length. The coma appeared to be, in a certain degree, illuminated from the nucleus, and the whole was compared by many persons to a distant building on fire. This evening, the following observations were made:—

| | h | ' | | ° | ' | " |
|--------|---|-----------------|--------------------------|---|---|----------|
| At | 6 | 40 | The comet from Jupiter | . | . | 81 55 55 |
| | 6 | 57 | . . below α Lyræ. | . | . | 59 0 20 |
| 3d. At | 6 | 33 | . . from Arcturus | . | . | 20 40 35 |
| | 6 | 52 | . . from Jupiter. | . | . | 81 17 15 |
| | 7 | 3 $\frac{1}{2}$ | . . below α Lyræ. | . | . | 57 32 45 |

4th. This evening there was an occultation of the planet Mars by the moon, at $7^h 2' 1''$ mean time: the moon was low, involved in the grosser horizontal atmosphere, and, apparently, almost touching the tops of the forest trees.

| | | h | ' | " | | | ° | ' | " | |
|-------------|-----|----|---|----|----|------------------------|---|----|----|----|
| 1807. Octr. | 5. | At | 6 | 39 | 0 | Comet from Arcturus. | . | 20 | 52 | 5 |
| | | | | 51 | 30 | from α Lyræ. | . | 54 | 42 | 10 |
| | | | | 7 | 15 | from ζ Herculis. | . | 31 | 32 | 55 |
| | 10. | At | 7 | 0 | 0 | from ζ Herculis. | . | 24 | 59 | 20 |
| | | | | 13 | 0 | from α Lyræ. | . | 47 | 53 | 40 |
| | 12. | At | 6 | 31 | 0 | from α Lyræ. | . | 45 | 20 | 7 |
| | | | | 48 | 0 | from Jupiter. | . | 76 | 11 | 8 |
| | 14. | At | 6 | 34 | 0 | from α Lyræ. | . | 42 | 47 | 20 |
| | | | | 53 | 0 | from Jupiter. | . | 75 | 13 | 0 |
| | 15. | At | 6 | 39 | 0 | from α Lyræ. | . | 41 | 33 | 0 |

The comet was dim this evening, caused by a mist or smoke which obscured the lower parts of the atmosphere, and became invisible before any more observations could be taken.

16th. At 6^h 57' 0'' Comet from α Lyræ. . 40° 17' 10''

The atmosphere was again so misty, or rather smoky, that no more observations could be taken: the cause of the smoky state of the atmosphere at this season, in our country, is the setting fire to the dry grass of the immense prairies or savannahs, and pine wood forests, in our neighbourhood; the smell of the burning pine, and other resinous aromatick vegetable matters is sometimes very strong, although the conflagrations which occasion it, are not supposed to be nearer than from 50 to 100 miles: dense clouds are frequently formed of the smoky vapour, from whence proceed violent tempests, with thunder and lightning, and torrents of rain of a brownish black colour.

| | | h | ' | " | | | ° | ' | " | |
|-----|----|---|----|----|---------------------------|-----------------------|----|----|----|----|
| 17. | At | 6 | 41 | 0 | Comet from α Lyræ. | . | 39 | 4 | 25 | |
| | | | 55 | 0 | from Jupiter. | . | 73 | 55 | 15 | |
| 18. | At | 6 | 52 | 30 | β Herculis. | . | 5 | 46 | 35 | |
| | | | 7 | 5 | 30 | from α Coronæ. | . | 12 | 46 | 45 |

The apparent length of the comet's tail was this evening about 2° 43' 30''.

| | | h ' " | | | | | ° ' " | | |
|-------|-------|-------|----|---------|---------------------------|---|-------|----------|--|
| 1807. | Octr. | 23. | At | 6 19 30 | Comet from α Lyræ. | . | . | 31 59 20 | |
| | | | | 38 30 | from α Coronæ. | . | . | 14 26 50 | |
| | | | | 51 30 | from β Herculis. | . | . | 0 47 55 | |
| | | 24. | At | 6 26 30 | from α Coronæ. | . | . | 14 58 40 | |
| | | | | 37 30 | from α Lyræ. | . | . | 30 50 30 | |
| | | | | 54 30 | from β Herculis. | . | . | 1 30 15 | |
| | | | | 7 22 30 | from Jupiter. | . | . | 71 17 0 | |
| | Novr. | 5. | At | 6 36 0 | from α Lyræ. | . | . | 17 38 50 | |
| | | | | 49 0 | from Jupiter. | . | . | 67 49 10 | |

The splendor and apparent magnitude of the comet visibly diminish; the nucleus seems reduced to little more than half its first observed magnitude.

| | | <i>h</i> | <i>'</i> | <i>"</i> | | <i>o</i> | <i>'</i> | <i>"</i> |
|-----|----|----------|----------|----------|---------------------------|------------------------|----------|----------|
| 17. | At | 6 | 42 | 0 | Comet from α Lyræ. | . | 5 | 20 32 |
| | | | 7 | 17 | 0 | from α Aquilæ. | . | 34 50 48 |
| 21. | At | 6 | 30 | 0 | below α Lyræ. | . | 1 | 30 20 |
| | | | 6 | 45 | 0 | below α Aquilæ. | . | 33 56 0 |

December 6th. Indisposition prevented observation for some time past. This evening being fine, I directed the reflecting telescope to the comet; the nucleus is now much diminished in apparent magnitude; I compared it with a star of the sixth magnitude in the Swan, which was within the field of view at the same time, their apparent diameters were nearly equal, but the comet is become so dim, as to be seen by the naked eye only in a pure atmosphere, with favourable circumstances: the weather being cold and damp, my state of health did not permit taking any distances: the coma is yet considerable, but the tail is no longer visible, one would be inclined to say, as the comet recedes from the sun, that the tail is *called in* (as it were) to add to the magnitude of the coma; for certainly the latter is but very little diminished in proportion to the nucleus.

In order to supply my own deficiencies, I shall here introduce the observations of Mr. Pease (on whose correctness I place the greatest reliance) during the time my own were interrupted by ill health.

Observations by Mr. Pease.

| | | | <i>h</i> | <i>'</i> | <i>"</i> | | | <i>o</i> | <i>'</i> | <i>"</i> |
|-------------|-----|----|----------|----------|----------|--|---|----------|----------|----------|
| 1807. Novr. | 21. | At | 6 | 51 | 35 | Comet below α Lyræ. | . | 1 | 29 | 30 |
| | | | | 58 | 20 | from α Aquilæ. | . | 33 | 55 | 0 |
| | 22. | At | 6 | 47 | 15 | from α Aquilæ. | . | 33 | 46 | 15 |
| | | | 7 | 39 | 15 | from α Cygni. | . | 24 | 15 | 45 |
| | | | 7 | 44 | 15 | left of α Lyræ, below. | . | 0 | 38 | 25 |
| | 24. | At | 6 | 44 | 42 | from α Aquilæ. | . | 33 | 31 | 30 |
| | | | | 58 | 42 | above α Lyræ. | . | 1 | 35 | 30 |
| | 30. | At | 6 | 31 | 7 | below α Cygni. | . | 16 | 44 | 45 |
| | | | | 36 | 7 | from α Aquilæ. | . | 33 | 27 | 35 |
| Decr. | 16. | At | 6 | 44 | 32 | below α Cygni. | . | 2 | 44 | 45 |
| | | | | 49 | 32 | to the right of γ Cygni. | . | 5 | 18 | 45 |
| | 18. | At | 7 | 11 | 38 | to the right of γ Cyg.i. | . | 6 | 7 | 45 |
| | | | | 27 | 38 | below α Cygni. | . | 1 | 16 | 30 |
| | 19. | At | 6 | 22 | 0 | The Comet was to the right of α Cygni | | | 51' | |

| | | h | ' | " | | h | ' | " |
|-------------|-----|----|---|----|----|-----------------------------|---|----------|
| 1807. Decr. | 22. | At | 6 | 47 | 0 | Comet above α Cygni. | . | 2 23 15 |
| | | | | 59 | 0 | from γ Cygni. | . | 8 26 45 |
| | | | 7 | 6 | 0 | from δ Cygni. | . | 12 43 45 |
| | 24. | At | 6 | 47 | 44 | from α Cygni. | . | 3 54 30 |
| | | | 7 | 8 | 44 | from Polaris. | . | 42 46 30 |
| | 30. | At | 7 | 30 | 0 | from α Cygni. | . | 8 21 20 |
| | | | | 31 | 0 | from Polaris. | . | 42 9 0 |
| 1808. Jany. | 1. | At | 8 | 30 | 0 | from Polaris. | . | 41 56 30 |
| | | | | 39 | 0 | from α Cygni. | . | 9 50 30 |

The comet now became too obscure to make any observations upon it, with the sextant, although Mr Pease has given two of the evening of the 22d of January, which he says are true only to five or six minutes, as follows,

| | | | | | |
|--------------|----------------------------|---|---|---|---------|
| 22. about 7h | Comet from α Cygni. | . | . | . | 23° 18' |
| | from Polaris. | . | . | . | 40 31 |

The observations which follow are extracted from my own journal.

January 5th. The comet is no longer visible to the naked eye; though having pointed the telescope to its calculated place, I discovered it a little to the S. E. of π 2 Cygni; but this star was not near enough in declination, to take the comparative position of the comet, with the micrometer of the reflecting telescope, in the manner pointed out by Dr. Maskelyne: however, as an approximation is often desirable, I directed to the comet and star, a very good small achromatic telescope, magnifying eleven times, and found that the two objects were distant from each other about two thirds of the diameter of the field of view of the telescope, and having placed the comet and star across the center of the field, and opening the left eye, I found that a line joining the star and comet, produced, would pass through η Pegasi; the angle of the field of view of the telescope having been ascertained to be $2^{\circ} 18' 26''$, two thirds of which are $1^{\circ} 32' 18''$ the distance of the comet from π 2 Cygni in the direction η Pegasi; from whence a good approximation of the place of the comet may be deduced. Note, the star π 1 Cygni is marked in Wollaston's catalogue, of the fourth magnitude and π 2 Cygni of the fifth magnitude, but π 2 is now the larger; the stars ought, therefore, to change designations.

The nucleus of the comet is yet to be distinguished by the reflecting telescope, but as small as a star of the seventh mag-

nitude, seen by the naked eye; the coma seems diminished more than half of its appearance, on the 6th of December, and the nucleus is equally surrounded by it on all sides, without any trace of tail, and so faint as very much to resemble some of the nebulæ.

January 15th. Since the fifth instant the weather has been unfavourable for viewing the heavens; this evening is very serene and freezing; after a little search, I found the comet with the telescope, between two small stars in Lacertæ, the position of the comet was again unfavourable for finding its relative place by the micrometer of the reflecting telescope, but having armed my small achromatic telescope with one of Cavallo's pearl micrometers, I took the distance of the comet from two small stars, the angle at the comet being nearly a right one, as follows:

At 7^h 0' Comet N. easterly from 5 Lacertæ 1° 14' 12'' of the 4th—5th magnitude,
 7 5 Comet S. easterly from 4 Lacertæ 1 24 48 of the 5th magnitude.

The uncertainty may be between one and two minutes.

In the great telescope, the comet is yet sufficiently conspicuous; the nucleus visible like a star of the eighth magnitude, in our purest atmosphere, and the coma but little changed since the 5th instant.

January 17th. The last evening was cloudy and rainy, but the weather cleared up mild this evening, which enabled me to direct the same instrument with the pearl micrometer to the place of the comet, which was very obscure, though I succeeded in making the following observations:

At 7^h 0' Comet S. easterly from 7 Lacertæ 2° 2' 58'' of the 4th magnitude,
 7 5 Comet N. easterly from 5 Lacertæ 2 5 5.

The uncertainty may be the same as on the 15th.

February 25th. From the 17th of last month the weather continued long unfavourable, and I despaired of again seeing the comet; but thinking it of importance to get a view of it once more, in a more distant part of its orbit, I searched with great diligence and some anxiety, and at length found an object which I had no doubt was the comet, situated between ξ Cassiopeæ and α Cassiopeæ; but as the objects were

now descending upon the tops of the forest trees, I had not time to complete my estimate of its place that evening, but marked particularly its position with regard to certain stars both in the field of the large telescope, and in the finder; the comet was not visible in the last, but its position was known by the intersection of the cross-wires, which coincided exactly with the center of the field of the telescope, reserving to myself the ascertainment of its place by the aid of those stars, in case the comet could not be again discovered.

For many days the weather was extremely unfavourable, and when it cleared up, I discovered the stars which had been noted, both in the field of the great telescope, and in the finder, but the comet had removed, and though diligently searched for along its supposed path, was seen no more. I now looked out for some known star, which might pass over the field of view of the telescope after the place of the comet, so as to be enabled to determine their difference in R. A. and declination; but none was to be found which would pass in any convenient space of time, and the place of the comet being now very low in the evening, I was obliged to make haste to approximate in the best manner now in my power; hoping in the course of some months to examine the subject again, when the part of the heavens where the comet disappeared should be conveniently seen in the eastern portion of the hemisphere.

The place where the comet was last seen, is in the line joining the stars ϵ and α Cassiopeæ, and the difference of the comet's place in R. A. from α Cassiopeæ was found, from observation, to be 96 seconds in time; from whence we deduce the comet's place on the 25th of February at 8^h to have been $8^{\circ} 7' 6''$ in R. A. and $48^{\circ} 30' 58''$ north declination. This is given only as an approximation.